

## **ONLINE TECHNOLOGY CONSULTING VIA INTERNET<sup>1</sup>**

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<sup>1</sup> Project realized on financial support by the Saxon Free State. Partners: CIM-Transfer centres from the universities in Chemnitz and Dresden, the Beckmann-Institut für Technologieentwicklung e.V. and the registered association for application of rapid technologies

## **Abstract**

Concerning the application of Rapid Prototyping methods especially in product development, an essential problem is that the customer companies are not aware of the possibilities and limitations of the individual RP techniques available on market. As another barrier, contacts to the associated service firms which might offer their equipment and experience other enterprises are frequently missed. This problem becomes obvious especially for small- and medium-sized enterprises (not limited to the FRG) not able to currently employ people for the search for appropriate advanced methods to solve their business tasks and those of the associated partners.

In recent years, the Internet and most of all the World Wide Web stand for an exploding information providing tool. To install a corresponding information- and consulting platform on Internet would provide a solution. The application<sup>2</sup> to be presented in this paper was realised at the Dresden University of Technology in co-operation with further partners.

## **1 Introduction**

To use the Rapid Prototyping method it is necessary to know the corresponding advances and disadvantages as well as their useful classification within process chains.

Especially interested RP newcomers who want to use this technology for their product development cycles have some difficulties in choosing the optimal technological procedures for their task. For selection, we need knowledge on the characteristics of these various methods and the associated interfaces, on the one hand. On the other hand, it is difficult to get in contact with experienced service firms. This demand for assistance is especially high for SME.

Similar approaches are followed by various German suppliers as the NC-society Ulm, the Rapid Prototyping Zentrum Bremen and the RP network of the iwb Augsburg. Furthermore, a database on company information Technologiezentrum Sachsen (Saxon Technology Centre). However, it is not possible to generate task-oriented process chains in an automated manner.

## **2 Database structure**

### **2.1 Basic structure**

To establish an Online technology consulting via Internet is seen as one possible way to be gone towards accelerated supply of information and covering demand for information of small-and medium-sized firms.

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<sup>2</sup> address: <http://modellfertigung.mw.tu-dresden.de>

Hereby, we may assume that the potential user won't have any fundamental problem to access to this new medium of information and communication.

In contrast to other data carriers, the World Wide Web enables to quickly and flexibly access to an immense volume of information even beyond borders. However, for the single user it seems to be difficult to get an overview about available data stocks as well as their evaluation. From the information supplier's point of view, current updating is complicated and expensive. To use supplier-independent databases corresponding short information and references for contact partners are integrated stands for one approach to structure available data inside the Internet.

To be able to handle the tremendous information on Rapid Prototyping respectively to constantly update, the presented project also makes access to a database system dynamically generating websites. Additionally, the manifold behaviour of the given information volume (and thereby the database as the used information carrier) demands for data structuring into several modules of autonomous content. Those modules should be explained in the following.

Figure 1 illustrates the structure of the entire Online technology consulting system created in joint work of the so-called centre for product and process innovation.

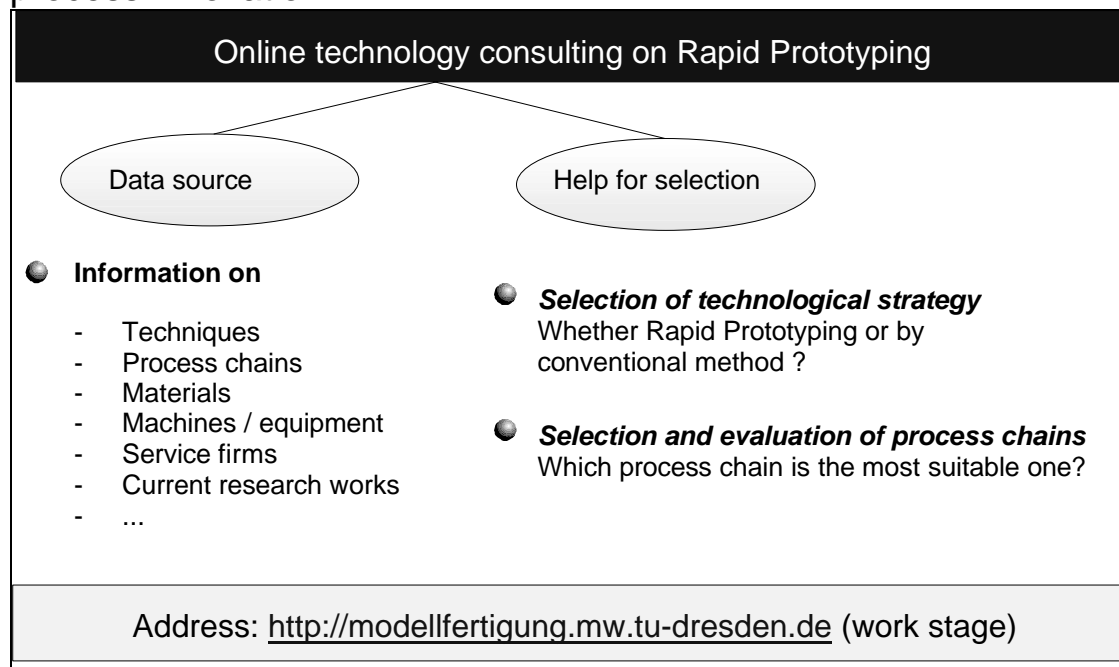


Fig. 1: Structure of the Online technology consulting system

## 2.2 Module 1: Method information module

This module describes on two detailing levels how the different methods work. The first stage foresees a general technological overview on each

RP method, the potential ranges of application and essential advantages and limitations. Level 2 points out specific information on failure sources, technological parameters etc. Due to the narrow relationship between preceding and subsequent processes of the associated RP technique, also overlapping process chains (even known under the term of Rapid Product Development – RPD) are described with respect to their elements and interfaces as well their suitability for special cases of application.

Based on the clear and hierarchic structure of available information, the interested person is enabled to access to various data according to his wishes and intents in a selective manner.

### **2.3 Module 2: Server- and system information**

Module 2 is concerned with facts and figures in conjunction with the RP techniques and those service firms acting on market in this field. These data can be specified as follows:

- Information on service firms working in the range of Rapid Product Development. This comprises the installed company equipment in the field of CAD, Rapid Prototyping and follow-up processes, the type of available systems, corresponding materials as well as administration data as address or contact person.
- Special information on the technical systems and the materials hereby in use as for instance the realised size of machinery, the materials to be applied or available at the corresponding server with their characteristics and the information where to be purchased.

The information included in this module are based on corresponding facts and figures on the service firms inserted into the database. The service firms may update the data in their own interest anytime.

The requester may get displayed all service firms registered, but also make a preselection according to distinguished criteria. In general, the service firms can be selected according to the following two options:

#### **1. Request according to regions**

The interested person is enabled to select a determined German region according to the city telephone code valid in the Federal Republic of Germany. As a result, he or she gets all or only special service firms inside this region out of the database displayed.

#### **2. Inquiry according to the feasible RP methods**

The RP systems to be run at the individual service firms are registered according to their technological classification and can be simultaneously taken as a selective criterion.

The two selection approaches may also be combined.

Having selected one server, further information on this firm may be extracted. These are general facts and figures as address, phone- or fax numbers as well as the surnames of the contact persons inside the business, on the one hand. On the other hand, data on the totally available business equipment can be made available.

## **2.4 Module 3: Selection of process chains**

### *2.4.1 Overview*

This component supports to select a process chain for a manufacturing task described by a requester. In addition to the recommendations on the individual methods, addresses for corresponding servers are also made available.

The selection of the process chains is based on the PROTOOL software package developed at the TU Chemnitz by KASCHKA /5/. This program was designed to provide methods for the selection and evaluation of process chains considering quality-, time-, cost- and environmental criteria. Depending on each application, two stages out of this methodology can be either run sequentially or separately.

### *2.4.2 Selection of the technological strategy*

In stage 1 of this paradigm, the user is enabled to perform main planning of the techniques and process chains in an order-independent manner. For example, this could be useful to evaluate manufacturing strategies for determined part families or to check whether Rapid Prototyping methods are generally suitable to solve this task.

As a starting point, the manufacturing techniques typically in use in tool- and die making are subdivided into technological strategies. Hereby, the techniques are assigned in a way distinguishing conventional methods as NC milling, eroding and more innovative techniques as Rapid Prototyping as well as technological combinations (for instance Rapid Prototyping and follow-up processes).

The representation of the component to be manufactured is concerned with administrative data as component name, but also geometric and technical characteristics.

The results of selection showing the manufacturing groups with respect to their possible applicability to realise the corresponding feature as well as the coordinative classification.

### *2.4.3 Process chains – selection and evaluation*

The second stage inside the methodology acts to support order-based decision making for the RP manufacturing sequences to be definitely used. At the beginning, based on a definite manufacturing task, a hierarchy on objectives including all relevant evaluation criteria is to be determined. Within the selection of process chains, it is internally guaranteed (checked) that only those manufacturing sequences fulfilling all the minimum requirements (e.g. to achieve a determined accuracy to size) will be further considered.

In the second stage, the most significant partial objectives as time, quality, cost, environment resp. energy are individually analysed and evaluated. In addition to this investigation, the user may also introduce (define) additional objectives. As a result, the process chains are ranked over each partial objective.

In the last stage, the user decides which partial objectives he intends to compare according to priorities and to summarize/ compress to only one parameter (total performance value).

The decision which manufacturing variant is most suitable is finally made by comparison of the process chains' total performance values.

## **3 Use of the database**

Basing on the experience of the project partners, the Online technology consulting system has been established step-by-step since 1998. The corresponding test version has already been made available under <http://modellfertigung.mw.tu-dresden.de/>. At present, the database includes a description of techniques nowadays available on the market. Additionally, it mainly spans information on service firms working in Germany, but also on some of the European suppliers. The entry volume may be extended anytime.

## **4 Expected benefit and prospects of success**

When using the "Technology consulting via Internet", the small- and medium-sized firms are expected to receive enhanced access to information for order preparation and –processing by electronic media. To apply advanced manufacturing techniques in product development, to cooperate with regional partners or to make use of the most innovative research results may enhance product quality. The processing time may be drastically reduced even by means of the data transfer of manufacturing programs via Internet.

In total, significant time- and cost reductions are to be expected by bundling the available know-how and manufacturing potential manifested by the firms realising innovative technology in practice and furthermore aggregated in the virtual network.

Simultaneously, enhanced quality of product development and manufacturing is expected since it becomes possible to achieve aesthetically and geometrically demanding products and parts, to fabricate complex products demanding for a lot of knowledge and expertise as well as the quick development of lightweight constructions.

Advantages are also obvious for the RP service firms. In addition to the better distribution of public knowledge about the technology offered by them, it is possible to rely on fault sources and critical issues in construction for prototyping in a concerted manner. To exclude the possible faults may reduce order processing.

## **5 Perspective**

The available database stands for a current survey on available techniques as well as the corresponding service firms. Since this can only be a snapshot, now it is utmost necessary to keep the information of the data stock up to date. In this context, the RP service provider and manufacturers of machinery are asked to make available current information to update the database.

As already mentioned, the Online technology consulting system and the corresponding database have been developed within the scope of a 3-year project sponsored by the Free State of Saxony. In a first stage, all entry masks were generated in German language. The data of the service firms situated in this Federal state were entered. As a next step, the usable data stock was extended to companies out of the entire region of the Federal Republic of Germany. Additionally, it is also possible to integrate international firms and their offers. Therefore, the user surface can be translated into English.

After completion of the project period sponsored by the Free State, all involved partners intend to update the database in co-operation with all bidders. At present, financing of this activity has not been solved yet.

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## **ONLINE-TECHNOLOGIEBERATUNG RAPID PROTOTYPING**

### Zusammenfassung

Ein wesentliches Problem bei der Nutzung der Verfahren des Rapid Prototyping speziell in der Produktentwicklung ist die fehlendes Kenntnis der auftraggebenden Firmen über die Möglichkeiten und Grenzen der einzelnen am Markt verfügbaren Verfahren. Weiterhin besteht häufig kein Kontakt zu entsprechenden Dienstleistern, die ihre vorhandene Technik sowie ihre gesammelten Erfahrungen anderen Unternehmen zur Verfügung stellen möchten. Dieses Problem besteht besonders bei kleineren und mittleren Unternehmen (nicht nur in Deutschland), die nicht über die wirtschaftliche Kraft verfügen, ständig Mitarbeiter mit der Suche nach geeigneten modernen Verfahren für ihre spezifischen Aufgaben und entsprechende Partner zu betrauen.

Das Internet speziell mit dem Bereich des World Wide Web stellt in den letzten Jahren ein stetig wachsendes Informationsinstrument dar. Es liegt daher nahe, in diesem Medium eine entsprechende Informations- und Beratungsplattform zu installieren. Die innerhalb dieses Papers vorgestellte Applikation wurde an der TU Dresden in Zusammenarbeit mit weiteren sächsischen Partnern realisiert und ist unter der Adresse <http://modellfertigung.mw.tu-dresden.de> verfügbar.